

ACT Bioenergy Project Report, March 2011: Natural History Museum of the Adirondacks (The Wild Center) Wood Pellet Boiler

The Wild Center in Tupper Lake, NY is a world-class natural history museum encompassing a 31-acre campus in the heart of the Adirondack Region of New York. In March 2010, the Center installed a 1.7 Million Btu/h ACT Bioenergy wood pellet boiler and integrated a solar thermal system to replace its existing propane system for both space and domestic hot water heating. The project was awarded: **North American Bioenergy Project of the Year (2011)** from Renewable Energy World Network of Publications.



Fig. 1 54,000 ft² Wild Center Building

The Wild Center has taken on a leadership role showcasing the first high-efficiency gasification-type boiler installed in the Adirondack Region of New York. A gasification boiler has a primary “gasification” zone where the fuel is first heated and volatile gases released and a secondary zone where additional air is supplied to completely burn-out



Fig. 2 Front View of ACT Bioenergy Boiler showing combustion chamber and control panel



Fig. 3 Side of Boiler showing vertical pellet auger delivery tube

the gases at high temperature. In the ACT Boiler, computer controls constantly monitor and adjust airflow, pressure, temperature, and oxygen levels to achieve a high-efficiency, clean operation. Clarkson University’s Center for Air Resources Engineering has coordinated extensive testing to confirm the efficiency and emissions performance of the system and has confirmed that the emissions are exceptionally clean compared with other wood boilers available in the U.S.

- ① RE-USED STORAGE CONTAINER
- ② 30 TONS OF WOOD PELLETS
- ③ SOLAR THERMAL PANELS
- ④ PELLET DISTRIBUTION DISPLAY
- ⑤ WOOD PELLET DELIVERY AUGER
- ⑥ EXISTING MUSEUM HEATING LOOP
- ⑦ SOLAR THERMAL STORAGE TANK
- ⑧ EXISTING PROPANE FIRED BOILERS
- ⑨ NEW WOOD PELLET BOILER SYSTEM
- ⑩ EMISSIONS TESTING EQUIPMENT
- ⑪ CHIMNEY

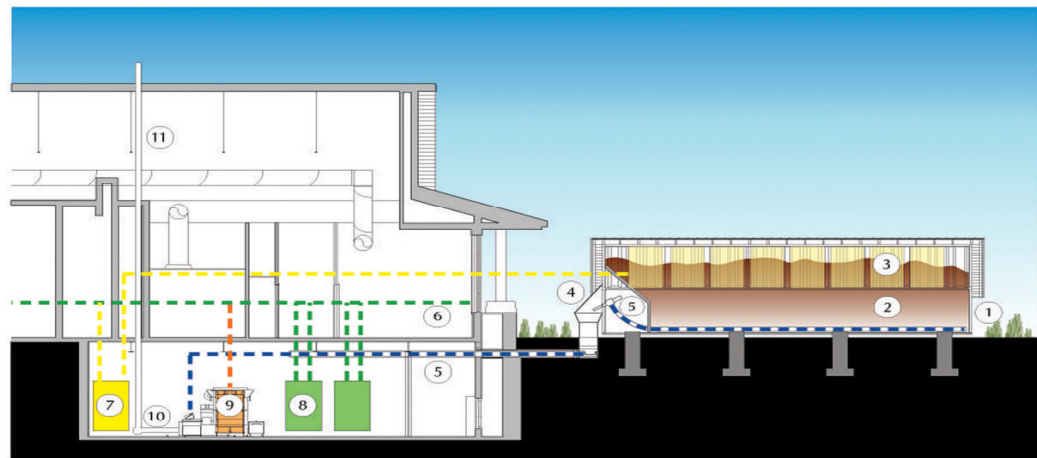


Fig. 4 Illustration of the pellet flow and solar water circulation systems with existing furnace systems design by CSArch Architecture.

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Although the ACT Boiler can burn either wood pellets or wood chips, the Wild Center determined that pellets would reduce on-site fuel storage and handling requirements. Pellets are about 2.5 times denser than wood chips and can be transported easily by auger systems. The pellet storage bin is a unique design from CS Arch Architecture that uses a recycled 40' long ocean shipping container that is balanced on its edge to form a "V" bottom so pellets flow easily into the auger collection system at the bottom of the "V". The 45 degree angle of the roof is also ideal for mounting solar panels and helped reduce the installation cost compared with using metal racks to mount the panels on a flat roof.

At the Wild Center, the pellets travel about 50 feet through a 4" diameter flex-auger from the storage container to the boiler. The pellets are locally manufactured in Massena, NY at Curran Renewable Energy and are delivered in a bulk by a standard grain feed delivery truck. Figure 4 shows the three round bulk loading ports on the top of the shipping container where the pellets drop into the container. The pellets supplied to the project are certified by the Forest Stewardship Council (FSC) to be responsibly and sustainably produced.



Fig. 4 Pellet storage bin with mounted flat plate and evacuated tube solar thermal collectors.



Fig. 5 Photo of chip fuel and pellet fuel

The wood boiler is integrated with the building's control system which adjusts the boiler water temperature depending on the heat load in the building and the outside air temperature. The solar thermal system is integrated with the wood boiler system so the "free" heat from the sun supplements the wood boiler and optimizes system efficiency. The propane boilers that were originally installed with the building remain in place as a back-up and as supplemental heat on colder days. By switching from propane to wood pellets, the Center expects to reduce its fuel cost by about 40% (~\$80,000/yr.) and will reduce greenhouse gas emissions by over 400 tons/yr.

The project was supported by \$350,000 in competitive grant funding from the New York State Energy Research and Development Authority's (NYSERDA). Francis J. Murray, Jr., NYSERDA President and CEO, noted NYSERDA's interest in this demonstration installation: "We commend The Wild Center for its commitment to incorporating renewable energy into its operations. Their use of pioneering made-in-New York technology will help promote high-efficiency, renewable-fuel boilers that reduce harmful emissions, burn local fuel, and further New York's efforts to reduce our dependence on fossil fuels, while helping to build New York's clean energy economy. We look forward to the installation's benefits, savings, and economic efficiency."

ACT Bioenergy other recent projects include: The State University of New York's School of Environmental Science and Forestry, Wanakena, NY; Craftsbury School, Craftsbury, VT; and at Fort Huachuca, US Army Base in Arizona, Full Bloom Greenhouse, Whately, MA.